

REMARKS

This is intended as a full and complete response to the Office Action dated December 19, 2003, having a shortened statutory period for response set to expire on March 19, 2004. Claims 1-36 remain pending in the application and are shown above. Claims 1-36 stand rejected by the Examiner. Applicants have amended claims 1, 17, 26, 30, and 33. Applicants reserve the right to pursue the subject matters of original claims 1, 17, 26, 30, and 33 at a later date. Reconsideration of the pending claims is requested for reasons presented below.

35 U.S.C. §102 Rejections

Claims 1-9 and 26-29 are patentable over *Tsai et al.* under 35 U.S.C. §102(e)

Claims 1-9 and 26-29 stand rejected under 35 U.S.C. 102(e) as being anticipated by *Tsai et al.* (Patent No. 6,524,167). The Examiner states that *Tsai et al.* teaches a method of removing a dielectric disposed on a substrate 300 having a shallow trench isolation (Figure 2) with a polishing composition comprising glycine. Applicants respectfully traverse the rejection.

Tsai et al. discloses a method and composition for selective removal of a conductive material residue and a portion of a barrier layer from a substrate surface. (See, Abstract and Summary of the Invention.) *Tsai et al.* does not teach, show, or suggest a method and composition having at least one organic compound, wherein the at least one organic compound enhances the removal rate of a first dielectric material using a fixed abrasive chemical mechanical polishing pad without affecting the removal rate of a second dielectric material, as recited in amended claims 1 and 26, and claims dependent therefrom. Withdrawal of the rejection is respectfully requested.

Additionally, *Tsai et al.* does not teach, show, or suggest polishing a shallow trench isolation structure, as recited in claim 9. Figure 2 of *Tsai et al.* illustrates a substrate structure 300 for metal application, having a dielectric layer 310, a plurality of openings 311, a barrier layer 312 on top of the dielectric layer 310, and a metal layer 313, such as a copper layer. The metal layer 313 fills the openings 311 and is disposed on top of the barrier layer 310 in order to be polished into a planar surface afterward. In

contrast, a shallow trench isolation structure is formed by deposition of a series of dielectric materials, for example, the trenches are typically filled with silicon oxide material on top of a silicon nitride layer. Figure 2 of *Tsai et al.* does not teach, show, or suggest these features, there is no filling of trenches with silicon oxide on top as illustrated by the Examiner's comments.

At page 4, lines 5-7 of the office action, where the Examiner states that "*Tsai et al.* teaches all the limitations of the claims except for the substrate including a shallow trench isolation comprising first and second dielectric layers, wherein at least one of the materials comprises a nitride layer". Thus, *Tsai et al.* does not teach, show, or suggest a shallow trench isolation structure, recited in claim 9. Reconsideration of the rejection of claim 9 is respectfully requested.

Further, the composition of *Tsai et al.* consists essentially of a chelating agent, an oxidizer, a corrosion inhibitor, abrasive particles, and water. (See, column 5, lines 16-24, and claims 1, 14, 15, 31.) Thus, the composition of *Tsai et al.* is a complex system that requires the presence of the chelating agent, the oxidizer, the corrosion inhibitor, abrasive particles, and water to be combined together for removing conductive layer residues and barrier layer materials. One example of the chelating agent is glycine, where the chelating agent chemically reacts with metal ions to minimize re-deposition of metal ions. (See, column 5, lines 25-37.) In contrast, polishing a shallow trench isolation structure having a series of dielectric materials does not involve chemical reaction with metals. Therefore, *Tsai et al.* does not teach, show, or suggest the method and composition for removing dielectric materials, including at least one organic compound selected from a group of amino acids, at least one pH adjusting agent, and water, wherein the at least one organic compound enhances the removal rate of the first dielectric material using the fixed abrasive chemical mechanical polishing pad without affecting the removal rate of the second dielectric material, as recited in amended claims 1-9 and 26-29. Withdrawal of the rejection is respectfully requested.

35 U.S.C. §103 Rejections

Claims 11-25 and 30-36 are patentable over *Tsai et al.* in view of *Kaisaki et al.* under 35 U.S.C. §103(a)

Claims 11-25 and 30-36 stand rejected under 35U.S.C. 103(a) as being obvious over *Tsai et al.* in view of *Kaisaki et al.* (WO 98/49723). Applicants respectfully traverse the rejection.

Tsai et al. is discussed above.

Kaisaki et al. discloses a method of polishing a wafer having a second conductive or barrier material (see, page 12, lines 12-14) deployed over a patterned layer of a first material using a fixed abrasive article until an exposed surface of the wafer is planar. (See, Figures 1-2, Summary, from page 3, lines 29-30 to page 4, lines 1-2, and throughout the patent application.) Thus, *Kaisaki et al.* discloses fixed abrasive technology with abrasive composites fixed to an abrasive article, having the advantage of selectivity to topography of two materials on a wafer until the exposed surface of the wafer is planar (See, page 3, lines 25-30 to page 4, lines 1-2.), and offers “stop-on-planar” capability. However, *Kaisaki et al.* does not teach, show, or suggest selectivity to material type. Therefore, *Kaisaki et al.* does not teach, show, or suggest what’s lacking in *Tsai et al.*, and *Tsai et al.* in view of *Kaisaki et al.* does not teach, show, or suggest a method of polishing a substrate having a first dielectric material and a second dielectric material, wherein the at least one organic compound enhances the removal rate of the first dielectric material using the fixed abrasive chemical mechanical polishing pad without affecting the removal rate of the second dielectric material, as recited in amended claims 11-25 and 30-36. Withdrawal of the rejection is respectfully requested.

In addition, *Kaisaki et al.* does not teach, show, or suggest a removal rate ratio of the oxide material to the nitride material of about 10:1 or greater, as recited in claims 17-25. In the last paragraph on page 3 of the office action, the Examiner disposes of the limitations reciting the removal ratio as being merely the optimum or workable ranges of general conditions disclosed in the prior art. This rule is not relevant to the present case because the prior art does not disclose the general conditions of using an organic compound in a polishing composition to effect differential removal rates. Reconsideration of the rejection is therefore requested.

Claims 9 and 10 are patentable over *Tsai et al.* in view of *Arthanari et al.* under 35 U.S.C. §103(a)

Claims 9 and 10 stand rejected under 35 U.S.C. 103(a) as being obvious over *Tsai et al.* in view of *Arthanari et al.* The Examiner states that *Tsai et al.* teaches all the limitations of the claims except for the substrate including a shallow trench isolation comprising first and second dielectric layers, wherein at least one of the materials comprises a nitride layer. *Arthanari et al.* teaches a shallow trench isolation comprising first and second dielectric layers, wherein at least one of the materials comprises a nitride layer, (col. 2, lines 52-55). The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made, to provide the invention of *Tsai et al.* with a substrate including shallow trench isolation, as a matter of design choice. Applicants respectfully traverse the rejection.

Tsai et al. is discussed above.

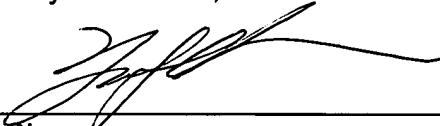
Arthanari et al. teaches a method of planarizing filler material in raised regions of a shallow trench isolation structure by first depositing filler material to a thickness to provide separate raised and lower regions of filler material. *Arthanari et al.* does not teach, show, or suggest a method of using a polishing composition for a shallow trench isolation structure. In addition, *Arthanari et al.* does not teach, show, or suggest a method of polishing a substrate having a first dielectric material and a second dielectric material, wherein the at least one organic compound enhances the removal rate of the first dielectric material using the fixed abrasive chemical mechanical polishing pad without affecting the removal rate of the second dielectric material, which is lacking in *Tsai et al.*, and as recited in amended claim 1, where claims 9 and 10 dependent from. *Tsai et al.* in view of *Arthanari et al.* does not teach, show, or suggest the method as claimed in claim 9 and 10 for selectively removing a dielectric material of a shallow trench isolation structure. In addition, there is no motivation to combine the teachings. It is known in the art that a polishing slurry for one material is generally not suitable for another material due to the complexity of chemical and mechanical interactions in a CMP system and can not be substituted as a matter of design choice. Accordingly, claims 9 and 10 are in condition for allowance and withdrawal of the rejection is respectfully requested.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

The secondary references made of record are noted. However, it is believed that the secondary references are no more pertinent to the Applicants' disclosure than the primary references cited in the office action. Therefore, Applicants believe that a detailed discussion of the secondary references is not necessary for a full and complete response to this office action.

Having addressed all issues set out in the office action, Applicants respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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